

3-2-1 Blast-Off

Name: _____ Other Group Members: _____

SCORE: _____/100

Phase 1: Design & Build (20 pts)

1. Create a blueprint (paper drawing) of your launcher. (4 pts)
2. Create detailed operation instructions. (4 pts)
3. Build launcher. (8 pts)
4. Revise blueprint and instructions to match your final launcher. (4 pts)

Phase 2: Testing (30 pts)

1. Describe the process your group used to calibrate your launcher. (4 pts)
2. Complete the following calibration table: (12 pts)

Expected Distance	Test Shot Distance 1	Test Shot Distance 2	Test Shot Distance 3	Test Shot Distance 4	Test Shot Distance 5
50 cm (19.7")					
75 cm (29.5")					
100 cm (39.4")					
150 cm (59.1")					
200 cm (78.7")					
250 cm (98.4")					

3. Once you set up your launcher for a specific distance, describe the accuracy of your launcher. (4 pts)
4. Draw a scatter plot of the relationship between each test shot distance and the expected distances. (6 pts)

Each point will be in the form (Expected Distance, Test Shot Distance).

So for the Expected Distance of 50 cm, suppose that my test shots were 44 cm, 49 cm, 53 cm, 55 cm, 50 cm. Then I would plot the following points on my scatter plot: (50,44), (50,49), (50,53), (50,55), and (50,50).

(Use a separate sheet if necessary.)

5. Write an equation for a line of fit for your scatter plot. (4 pts)

Phase 3: Shoot-Out (30 pts)

1. What is the target distance for the Shoot-Out? (2 pt)

2. Complete the following table with the distances that each group achieved for each of the 10 shots: (4 pts)

Group	1	2	3	4	5	6	7	8	9	10

3. Complete the following table based on the information you acquired in #2: (16 pts)

Group	Min Value	Q ₁	Q ₂ (Med)	Q ₃	Max Value	Range	IQR

- Q₂ is the median of the data, which is the number directly in the middle of the data when placed in order.
- Q₁ is the number in the middle of the first half of data.
- Q₃ is the number in the middle of the second half of data.
- IQR (Interquartile range) is the Q₃ - Q₁.

4. Which launcher was most accurate? Why? (4 pts)

5. How did the measures for your launcher compare with the target distance? (4 pts)

Phase 4: Error Analysis (20 pts)

1. Complete the following table of error measures for the data for each group: (16 pts)

Group	Error Range	Tolerance	Relative Error	Average Error

- The longest shot minus the shortest shot is the **error range**.
- The **tolerance** is the distance between the target distance and the farthest shot from the target.
- The ratio of the tolerance to the target distance (expressed as a percent) is the **relative error**.
- **Average Error** is computed in the following manner:
Using the target distance and each of the distance shots, find the absolute value of the difference between each of these values. Calculate the mean of those differences, by adding all the absolute differences and dividing the sum by 10 shots.

2. Based on all of the data that you have collected, which launcher would you consider to be the most accurate? Explain your reasoning. (4 pts)